PROFILE

AFV WEAPONS

46

40p

Light Tanks M22 Locust and M24 Chaffee

by Colonel Robert J. Icks

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by R. M. Ogorkiewicz

40 **U.S. Armored Cars**
by Colonel Robert J. Icks

41 **M103 Heavy Tank + M41Light Tank (Walker Bulldog)**
by Colonel Robert J. Icks

42 **Modern Swedish Light Armoured Vehicles**
by R. M. Ogorkiewicz

43 **PanzerKampfwagen IV**
by Walter Spielberger

44 **Ferret and Fox Scout and Reconnaisance Cars**
by R. M. Ogorkiewicz

46 **Light Tanks M22 (Locust) and M24 (Chaffee)**
by Colonel Robert J. Icks

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AFV/Weapons Series 1–42 inclusive 35p each; 43 onwards 40p each.

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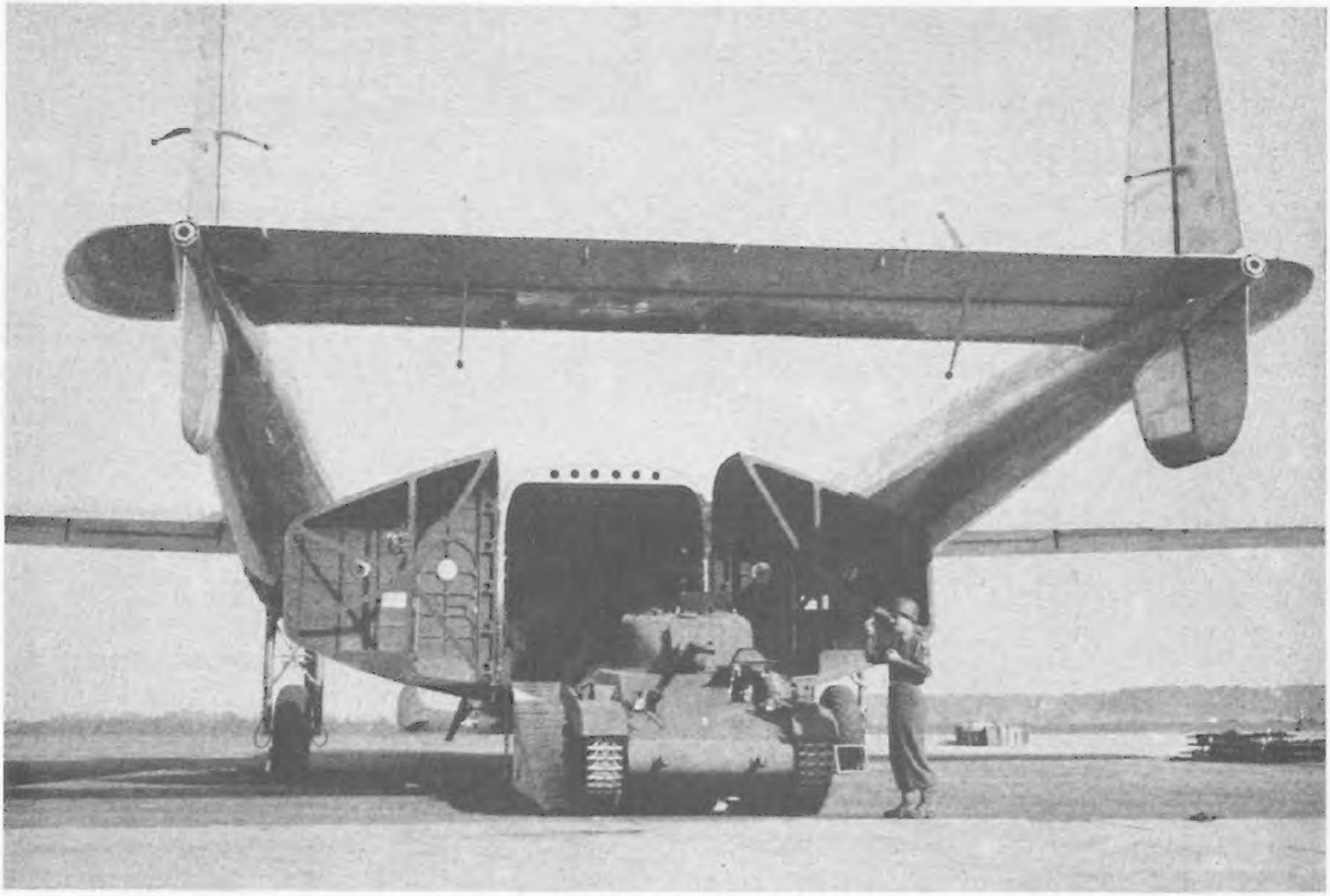


M22 Light Tank being loaded into a cargo plane at an Army Air Corps base. (U.S. Air Force)

M22 Locust Light Tank

by Robert J. Icks, Colonel AUS-Retired

THE German paratroop landing in Norway in April 1940 and the drop the following month at Fort Eben Emael in Belgium brought military men in the United States to the realization that a new dimension had been added to warfare. Yet it should not have been a surprise to them. It certainly was known that the Soviets had used paratroops in maneuvers and had used airborne tanks in taking over Bessarabia from Romania, even if it had been forgotten that Captain (later Sir Basil) Liddell Hart had advocated "vertical envelopment" in the early 1920s.

The Russian airborne tank originally was a modified T26 carried under the belly of a Gorki bomber. Later Russian light tanks were known to have airborne capability. But in the 1930s the Russians had been familiar with the efforts of J. Walter Christie to interest the U.S. Army in different models of airborne tanks and in their military application. Christie vehicles all were light weight and mechanically not fit for combat but he himself said he was only an ideas man and that the development of ideas was the responsibility of others. The Russians and to a lesser extent the Czechs took him at his word. The pre-World War II Czech AHIV Sv sold to Hungary and Sweden and the AHIV-J sold to Portugal as well as the related R-1 tanks sold to Iran and Romania were all known to have airborne capability. The British also had developed prior to World War II the Tetrarch, an airborne light tank.

But this situation was not unlike the Allied "surprise" over the appearance of the "new" German 88 in Libya. The fact that this gun had been used by the Condor Legion during the Spanish Civil War was no secret either.

At any rate, in February 1941, eleven months before the United States became involved in World War II, representatives of the Ordnance Department conferred with representatives of G-4 of the General Staff, the Army Air Corps and the Armored Force, to consider the development of a special light tank as well as an aircraft to transport and land it. The result of the conference was that Ordnance was to develop such a vehicle and the Army Air Corps was to undertake the

The T9 with original suspension, turret, bow, dual bow guns, and driver's hatch. (Courtesy—Marmon-Herrington Company)

development of an airplane to carry it. Because of an earlier opinion obtained by the British Purchasing Mission in the United States from an American manufacturer that the weight limit of such a vehicle in the light of then known aircraft capability could not exceed 7½ tons, this weight was adopted by the conferees.

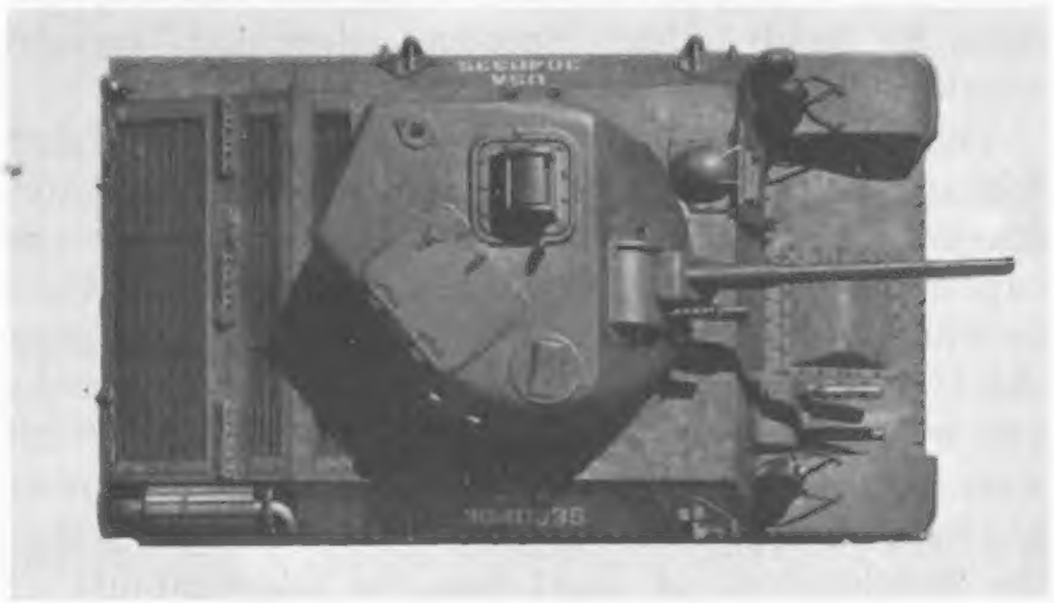
Ordnance requested studies from General Motors Corporation, Marmon-Herrington and J. Walter Christie. There is no record that any consideration was given to a Siegfried Bechold of the Armoured Tank Corporation who had advertised in 1940 and 1941 an Aero Tank which appeared to be very similar to the 1932 Christie vehicles. At a conference in May 1941 an examination of the designs submitted led to acceptance of the Marmon-Herrington design. This firm had built light tanks for export for a number of years, the latest models of which had been intended for the Chinese and Netherlands East Indies governments but could not be delivered. They were purchased by the United States and issued to U.S. troops in Alaska as the T14 Light Tank.

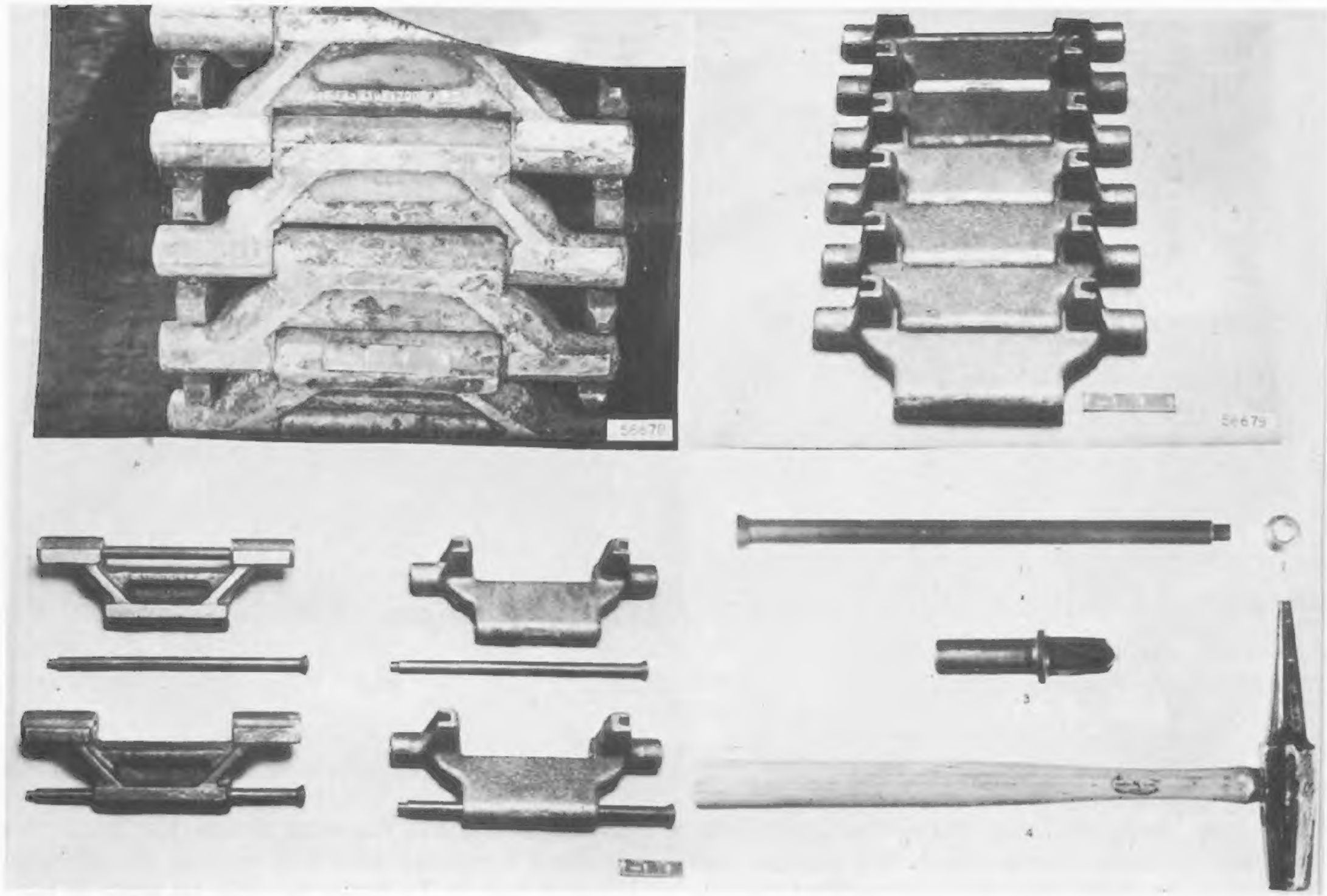
Military characteristics for the new airborne tank were drawn up in August 1941 and purchase of a pilot Light Tank T9 (Airborne) was approved. The vehicle in appearance was almost a miniature Sherman. It had a 37mm gun and coaxial .30 caliber machine-gun in a cast turret offset to the left in the rear. The hull was welded and in the first 26 the driver's hatch cover was cube-shaped. There were also two .30 caliber machine-guns in the bow. Maximum armour thickness was one inch. The tracks were T78 Carden-Loyd type malleable iron dry pin links 11¼ inches wide with three inch pitch. The ends of the track pins after insertion were crimped with a special tool. There were two bogie assemblies of two wheels each per side using volute springs and with two support rollers. In successive models changes were made in the suspension. The first change was to strengthen the assembly by means of a connecting steel beam. But because of the added weight, a steel rod replaced it. In production, the bogie frames also were slotted to reduce weight.

The first pilot demonstrated that the original weight limit could not be met so it was increased to 7.9 tons. The Army Air Corps (and the British who became interested) agreed to the increase in weight.

Two additional pilots were contracted for in January 1942. Changes were made during the following month causing them to be designated T9E1. The turret design was made more symmetrical and it was lightened, the power traverse, gyro stabilizer and bow machine-guns were eliminated to reduce weight and the front of the hull was reshaped. In addition, the engine louvering was changed. The first T9E1 was completed in November 1942 and sent to the Aberdeen Proving Ground for test. After completion, the second pilot was shipped to England.

Top view of the T9 after addition of air carrying brackets and showing offset shape of original turret. (General Motors Proving Ground)





The Marmon-Herrington short pitch track with special tools for crimping track pin ends. (U.S. Ordnance Dept.)

The T9E1 Light Tank with strengthened air carrying brackets, new front end, elimination of bow machine-guns, and lightened suspension units.
(U.S. Ordnance Dept.)

T9 modified to add suspension support beam and showing air carrying brackets. (General Motors Proving Ground)

Contrary to the customary sequence of events of not authorizing production of a vehicle until after development and successful tests, Army Service Forces approved quantity production before service tests were made. In April 1942, 500 were ordered. Shortly afterward 400 more were added to the order and later still 1000 were added for a total of 1900. Deliveries were to begin in November 1942. However, production difficulties and design changes caused this to be moved forward to April 1943. Deliveries were made according to the following schedule:

April 1943	7
May	35
June	55
July	82
August	101
September	100
October	100
November	100
December	100
January 1944	100
February	50

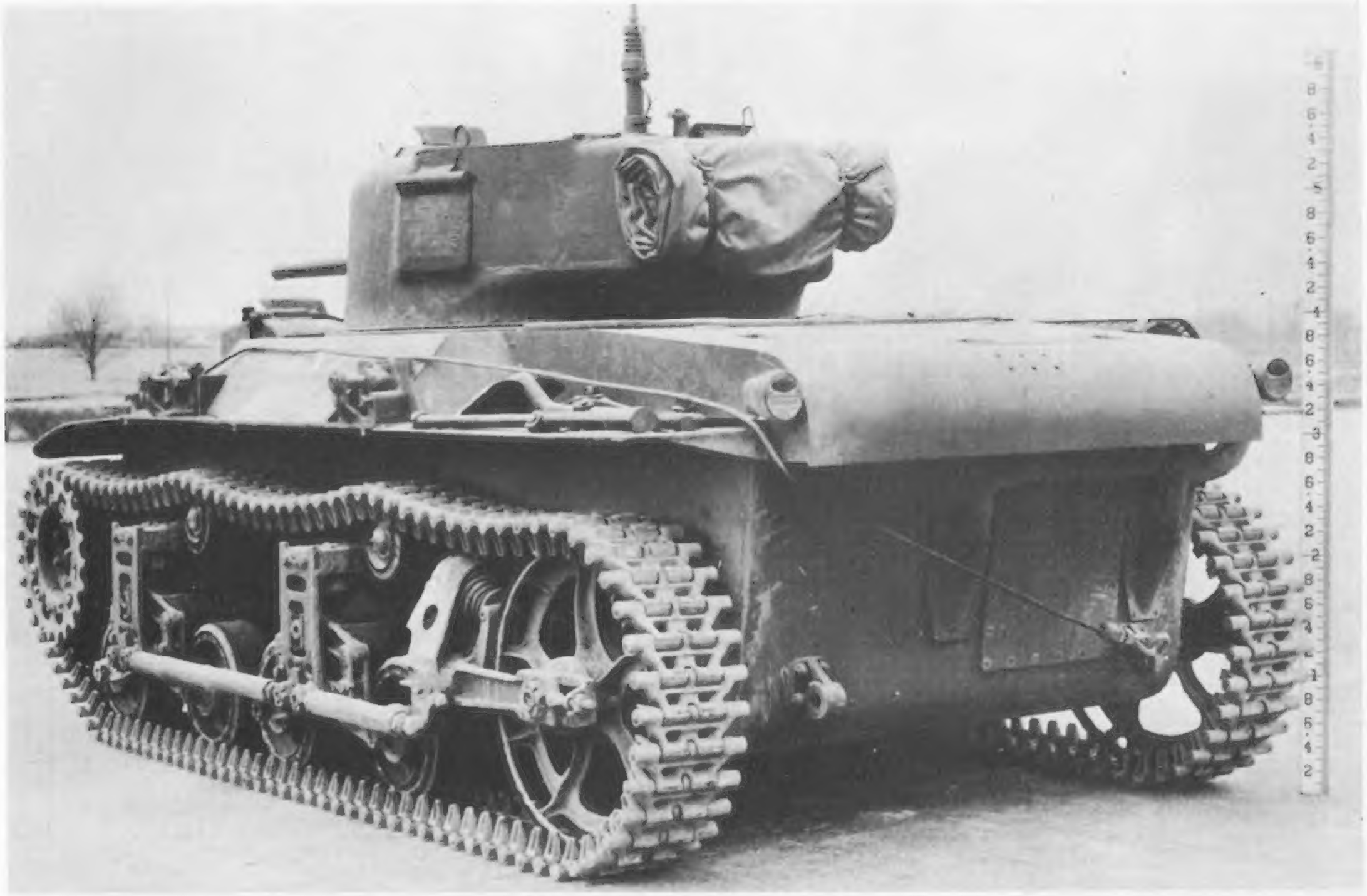
By February 1944, a total of 830 had been produced. The T9E1 was standardized as the M22, announced as being limited standard only and production was cancelled.

Ordnance at the Aberdeen and General Motors Proving Grounds and the Armored Board at Fort Knox continued to conduct separate testing programs during 1943 and 1944. The Army Air Corps also conducted flight tests with the C-54. As a result of these tests, brackets were provided on the sides of the hull for engaging with lifting hooks on the plane for air lifting. But, in order to carry the tank, it was found that the turret had to be removed.

Several hundred vehicles were shipped overseas to Britain and to U.S. forces but none was used by U.S. troops in combat. Claims were made in advertising by both American Steel Foundries and Marmon-Herrington in 1945 that the M22 had been used in the Normandy landing but these probably were made on the strength of newspaper reports that airborne tanks had figured in the landing. However, these were Tetrarchs carried in Hamilcar gliders. The British 6th Airborne Reconnaissance Regiment of 6th Airborne Division had 16 Tetrarchs but only six seem to have been used. Locusts – as the M22s were nicknamed by the British – as well as Tetrarchs were used in small numbers by the British 6th Airborne Division in the Rhine crossing on March 24, 1945. In July 1945 no further need was seen for the M22 and it was declared obsolete.

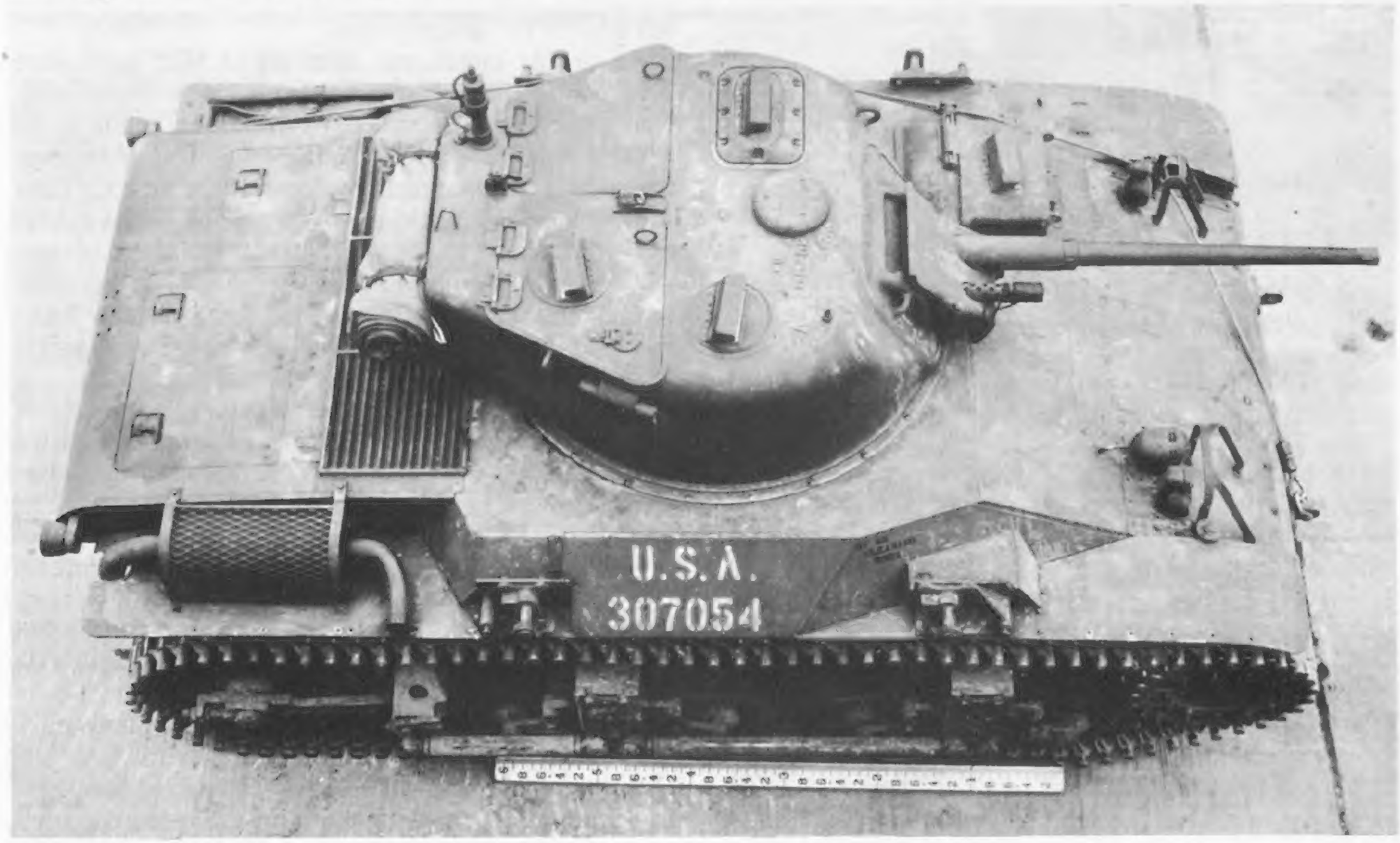
The Airborne Center in mid-1944 had submitted plans to Army Service Forces for an improved airborne tank to be suspended beneath a plane and to be launched from it in flight. But the minimum flying speed of over 100 mph and the maximum tank landing speed likely to be attained being only 40 to 50 mph the plan was considered impractical. This proposal was reminiscent of the plan J. Walter Christie had in mind in the early 1930s. At that time it might have been feasible because he had a light tank which in its existing form would have been unsuitable for combat but was capable of speeds up to 100 mph. At that speed and with tracks turning prior to being dropped there was a good possibility that this method of launching could have succeeded. However it was never tested. The reason was that, although he was perfectly willing to try, the Ordnance civilian test driver named Walter Fadeley who often drove for Christie when he was off duty, was forbidden by his superiors to attempt it. Fadeley had agreed to attempt the launching on a week-end for the munificent fee of $50.

The Airborne Center by December 1944 had decided that there was no further need for an airborne tank but Army Ground Forces wanted to continue experimenting. Ordnance studied the possibility of carrying the M24 Light Tank and the M18 Gun Motor Carriage in the C-82 cargo plane and the XCG-10A glider. But the tests revealed that it required breaking up the vehicles into two loads and that five men, two sets of tools and 3½ hours of work were needed to reassemble



Rear view of T9E1 showing modified cooling arrangement and exhaust outlets. (U.S. Ordnance Dept.)

T9E1 Light Tank top showing turret changes and details of hull construction. (U.S. Ordnance Dept.)



T9E1 Light Tank with final form of bow showing track detail and stowage of tow cable. (Courtesy Marmon-Herrington Company)

M22 Light Tank with Littlejohn Muzzle Adapter.

them. These were cogent reasons for declaring such an arrangement impractical.

The M22, while it could be transported, also had to be broken up and, in addition, had many other limitations. Its armour was too thin to withstand even .50 caliber armour piercing ammunition. The engine was underpowered, mechanical reliability was poor, and it was armed with only a 37mm gun which by 1945 was of little tactical value. Army Ground Forces finally lost interest because of strategic limitations. The C-54 required a long runway to land and satisfactory airfields could be at a considerable distance from the area of combat need, thus giving an enemy time to counter with heavier tanks.

One of the M22s was built as the T18 Light Tractor (Airborne) intended to carry five men and to tow the special sawed-off 105mm airborne howitzer, but this project ended in 1943. Another experiment was the T9E2 Light Tank. This was to have been armed with the 81mm breechloading mortar but it never progressed beyond the design stage.

As already mentioned, numbers of M22 tanks were sent to England. A project there is worth mentioning. One vehicle was modified by installing a Littlejohn Muzzle Adapter on the 37mm M6 gun. It is believed that this is the specimen gun now at the R.A.C. Tank Museum. In the Littlejohn Adapter the initial caliber of the AP shot was squeezed down by about one third while passing through the adapter. This was the same type of installation as applied to the Mark Xa 2 pdr gun used in Tetrarch and Valentine Mark V tanks and in Daimler armoured cars.

After World War II the remaining Locusts in England were scrapped and found their way into the hands of Belgian scrap dealers, some of them ending up with the Egyptian Army following the first Israel war.

The Russians built a small T34 airborne tank in 1947 (not to be confused with the T34 medium tank). The building of airborne tanks was then dropped but in recent years airborne units have been equipped with the ASU 57, an airborne self-propelled gun. For a time following World War II in the United States there was an extreme interest in complete airborne mobility. During that period, the T92 Airborne Tank, designed and built by the AAI Corporation, received consider-

The T18 Cargo Carrier (Airborne) with final M22 suspension and front end but with raised hull. (Courtesy Marmon-Herrington Company)

able publicity, partly for the reason that it carried a 90mm gun as well as for its novel cleft turret. But interest in airborne tanks again appears to have waned.

ESSENTIAL DATA FOR THE M22 IS AS FOLLOWS:
Crew: 3
Weight (loaded): 16,452 pounds
Weight (empty): 14,490 pounds
Length: 12′ 11″
Width: 7′ 4½″
Height: 4′ 1″
Clearance: 9½″
Track (width): 11¼″
Track (pitch): 3″
Number of shoes: 212 per side
Engine: Lycoming 0–435T aircooled boxer type 162 HP
Transmission: Marmon-Herrington Synchromesh 4F1R
Fuel Capacity: 57 short gallons
Steering: Controlled Differential
Suspension: Vertical volute spring 2 bogie wheel pairs, 2 return rollers, trailing idler, bogie wheels 15″ x 6″
Armament: 37mm L/37 M6 –10 +30, coaxial Browning machine-g
Ammunition: 50/2500
Armour: Cast turret 1″ all around, ⅜″ to ¾″ top, welded hull 1″ frontal vertical, ½″ at 60° ⅜″ sides at 45° ½″ rear and belly
Speed: 40 mph
Grade: 27°
Ford: 3′ 2″
Trench: 5′ 5″
Climb: 12″ to 18″
Radius: 135 miles
Turning Circle: 40′

Above: The T92 Airborne Light Tank built by Aircraft Armaments Inc. had its gun in a cleft turret. Prototypes were built in 1956 and 1957 but the T92 was not adopted. (Aircraft Armaments Inc.)

Below: View of the T92 Light Tank showing its cleft turret. As in a conventional turret the gun is elevated on its own, but its depression is achieved by allowing the breech assembly to move up through a large aperture in the roof instead of by having adequate room within the turret. This allows the height of the cleft turret to be considerably lower than that of a conventional turret and thereby reduces its frontal area. But the cleft turret has disadvantages, including the difficulty of sealing it. (Aircraft Armaments Inc.)

Reconnaissance squadron of newly arrived M.24 tanks in leaguer near Kornelmunster during the advance into Germany, Boxing Day 1944.
(U.S. Army photo)

M24 Chaffee Light Tank

by Robert J. Icks, Colonel AUS-Retired

BECAUSE the M.24 Light Tank did not get into production until mid-1944, it saw only limited service during World War II. A number reached the European theatre by the end of 1944 and took part in the crossing of the Rhine and the final advance into Germany. They shared the triumph of the Victory Parade in Berlin but there are no significant records of combat achievements. The same is true of the Pacific theatre. The first major American combat experience with the M.24 was in the Korean War in 1950. And when this challenge came the modest 18 ton M.24 was the only fighting vehicle immediately available to face the North Korean advance spearheaded by one of the most formidable fighting tanks ever built—the Russian T-34/85.

The rapid demobilisation of the United States Army after World War II resulted in the occupation forces in both Germany and Japan being made up of inexperienced troops in badly undermanned units. The forces in Japan particularly, intended principally for police duty, were lightly equipped. And, although U.S. infantry division organisation at that time provided for the inclusion of a tank battalion, the four divisions in Japan each had only a light tank company, equipped with M.24s, because of the limited load-bearing strength of Japanese bridges. Underlying this weakness was the fact that tanks no longer were considered very important. The attitude of the American authorities can best be illustrated by a statement made in June 1950 by the United States Secretary of the Army. Speaking to the graduating class of the Military Academy at West Point, he said: "It may well be that tank warfare as we have known it will soon be obsolete". A few weeks later North Korean forces and their T-34/85s were striking into South Korea. Many of these troops were battle wise, having served with other communist armies in Europe and in China.

President Harry S. Truman immediately ordered American troops from Japan to assist South Korea in

Pilot model of T.24 light tank, 1943. (Photo: Icks collection)

repelling the invasion and asked the Security Council to make it a matter for the United Nations. Three North Korean divisions with armour were making their principal thrust down the Seoul-Taejon railway. A parallel column in central Korea was moving to cut the railway east of Taejon and separate columns were moving down both the east and the west coast. The four light tank companies with fewer than 50 M.24s total strength had been formed into a provisional tank battalion. They moved up on July 7 to join with the 24th Division in the area north of the Kum River near the rail junction town of Ch'onan. The exhausted advance U.S. forces withdrew from Ch'onan on July 9 under defilade fire from the hills to their flanks, passing through the relieving 24th Division, which fought bitter delaying actions from Ch'onan to Kongju, with its M.24 tanks dug in as artillery to form a leapfrogging rear guard. The M.24s went into combat for the first time against the T-34/85s on July 11, attempting to hold the North Koreans while the American forces were crossing to the south side of the Kum River. But it was an unequal task and by July 15 the North Koreans had established a bridgehead beyond the Kum River north-west of Taejon and the M.24s were withdrawn south of the river. The enemy then forced into Taejon and by July 24 the Americans had formed a defensive perimeter around Pusan where M.24 tanks again were emplaced as artillery. Together with the half-track M.15 A1 and the M.19 Multiple Gun Motor Carriage on the same chassis as the M.24, both intended as anti-aircraft weapons, the M.24s had formed mobile bases of fire as well as flank protection during the two-week delaying action.

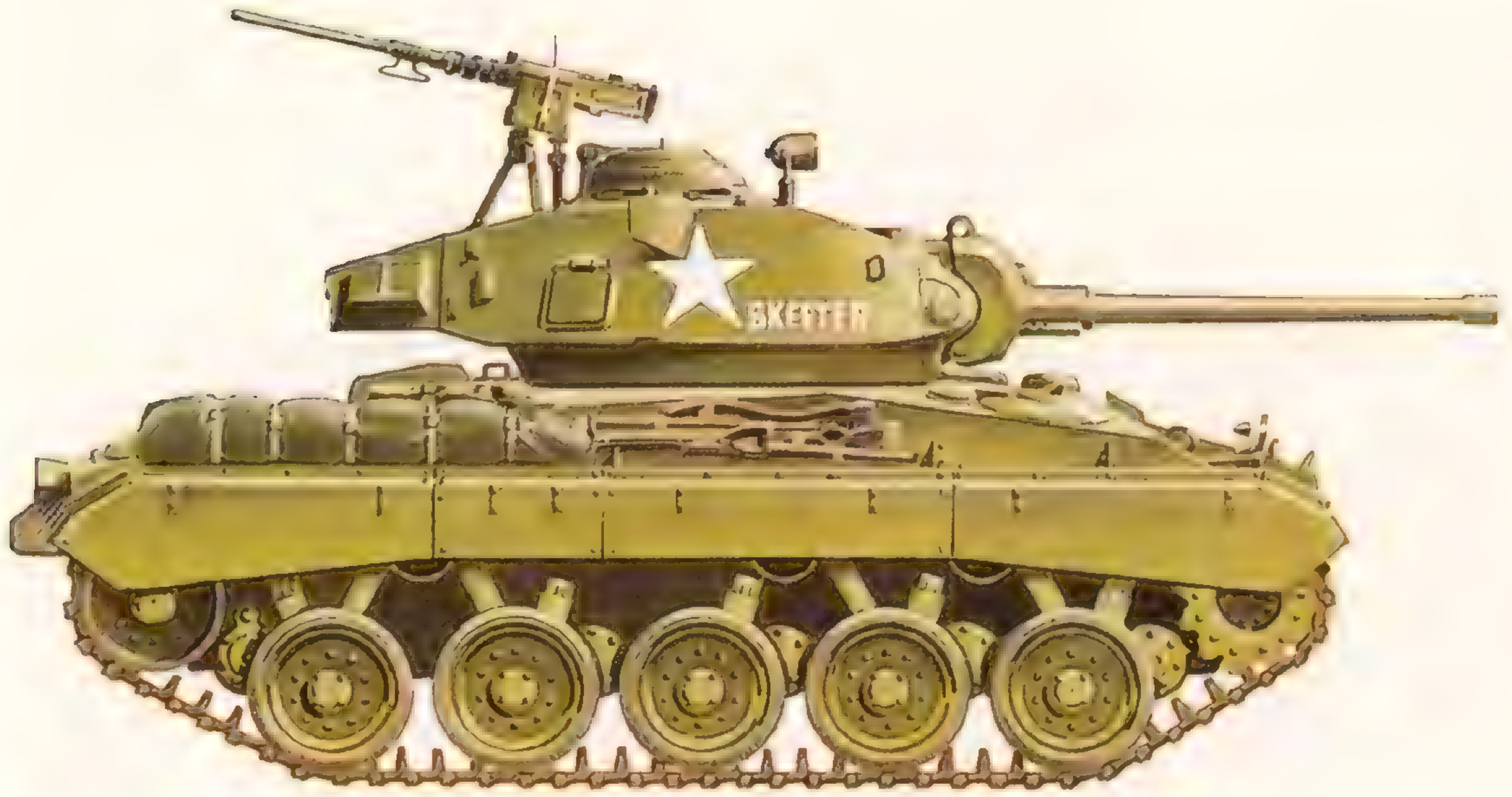
The relief of the light tanks came in the first week of August with large reinforcements from the U.S. including Sherman "Easy Eight" M.4 A3 E8 and M.26 Pershing tanks. At the end of the month elements of the British Commonwealth Division began to arrive which would add Centurion 3 tanks to the United Nations forces. All three tanks were capable of combating the T-34/85 and from then on armour was more evenly matched. The M.24s were withdrawn and later rebuilt in Japan for use by the Japan Defence Force. The M.19 and M.41 self-propelled mounts continued in use throughout the Korean War, and the former was frequently modified by the addition of a ·50 cal. machine-gun on the glacis by crews for sniper protection.

For the M.24 the war in Korea was the opening of its most notable rôle as one of the most ubiquitous fighting vehicles of the Cold War period now starting in earnest. It proved an ideal vehicle—mobile, reliable and well armed with a 75 mm. gun firing the same ammunition as the 75 mm. Shermans—to equip the rapidly growing number of nations seeking to rearm with U.S. aid. A complete list would include: Australia, Austria, Belgium, Canada, China (Taiwan), Denmark, Ethiopia, France, Greece, Iran, Iraq, Italy, Japan, Laos, Netherlands, Norway, Pakistan, Philippines, South Korea, South Viet Nam, Spain, Thailand, Turkey and U.K. France also obtained the companion M.41 Howitzer Motor Carriage and Japan the M.19 Multiple Gun Motor Carriage. In Britain, the M.24 was named Chaffee in honour of General Adna R. Chaffee, the father of the U.S. armoured forces.

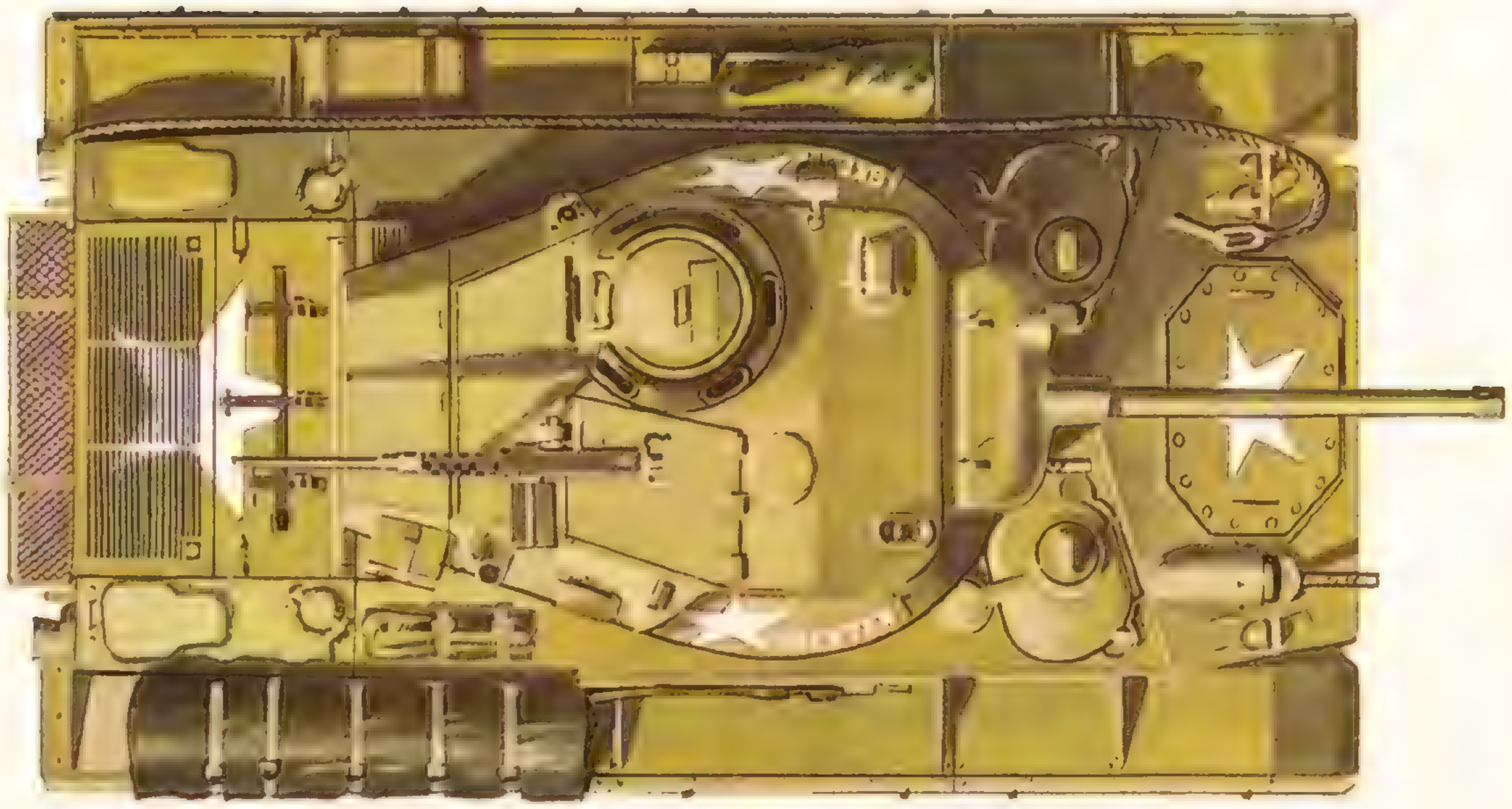
French forces in Indo-China used the M.24 in fighting the Viet Minh, and also in the Algerian War, principally for column convoy and perimeter defence in guerrilla warfare. In some of the other countries, the M.24 has appeared from time to time in various coups or civil disturbances.

DEVELOPMENT

The M.5 A1 Stuart VI was an excellent light tank but



LIGHT TANK M24
External equipment specified and carried complete on this tank includes: axe, matlock and handle, shovel and sledgehammer, tow cable, tarpaulin, rammer staff, camouflage net and spotlight.

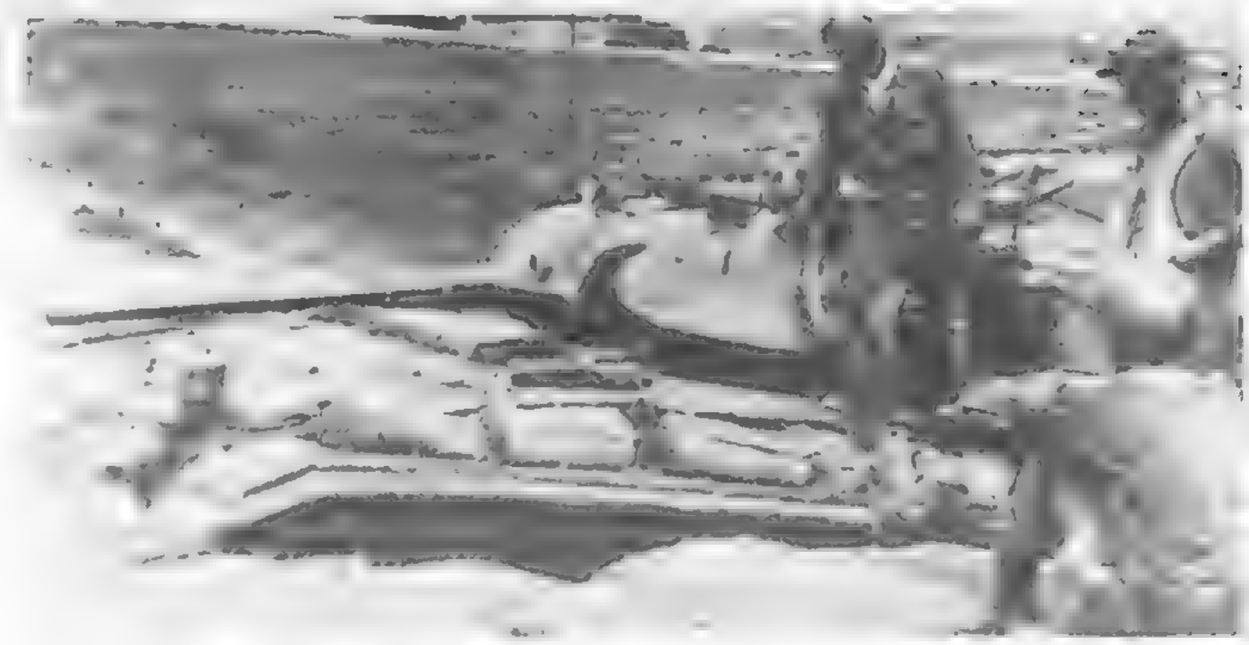


This vehicle typifies the appearance of M24 as it first appeared in service with U.S. Army reconnaissance squadrons in N.W. Europe in late 1944. Unit markings were obliterated for security reasons and during the advance into Germany the light M24s often moved heavily sandbagged for extra protection on the glacis plate and hull sides.

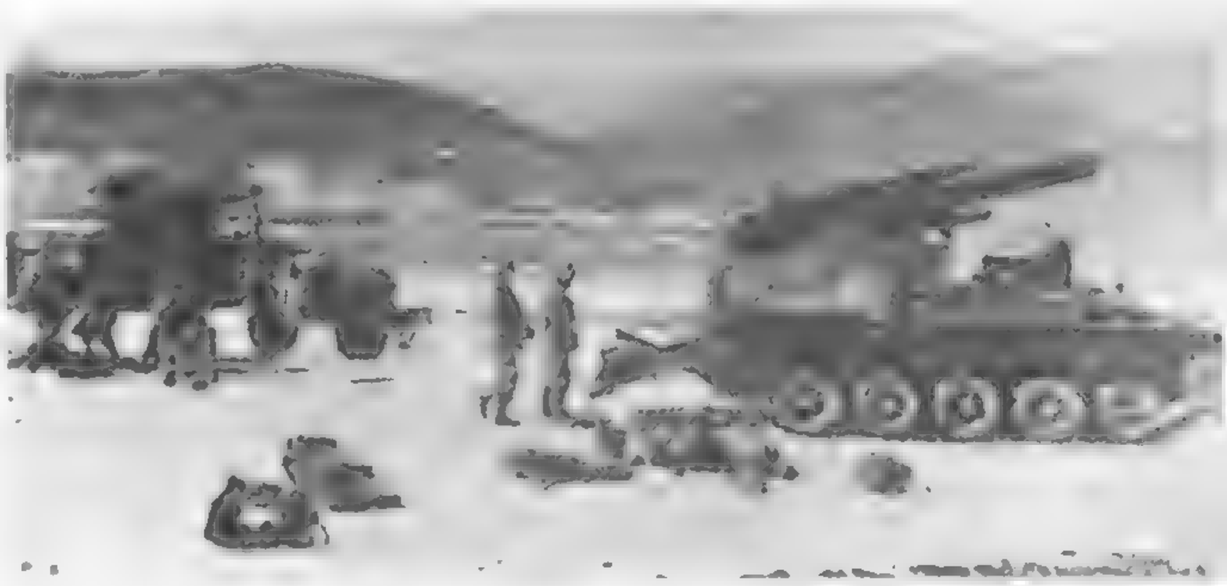
T.24 standardised as M.24 with addition of turret vision cupola, modified AA machine-gun mounting and gyro stabiliser.
(Photo: Icks collection)

it was obvious by 1942, particularly from British combat experience in the Western Desert, that the 37 mm. gun was inadequate. Consideration was given to mounting a 75 mm. gun but this was not acceptable to Army Ground Forces. A T.21 Light Tank was studied and also rejected because its weight exceeded by four short tons the 20 ton weight limit which had been established for this class of vehicle. The excellent T.7 Light Tank had been built in several versions at Rock Island Arsenal and one was selected as a possible replacement for the M.5 A1. The British also were interested in the T.7 and wanted it armed with the 6 pdr. but the American Armored Command demanded a 75 mm. gun. It was next considered as a possible replacement for the M.4 Medium series so the Armored Command demanded a further series of modifications, including heavier armour. These patchwork modifications made the T.7 Light Tank into an overloaded M.7 Medium Tank which was satisfactory in neither the light nor the medium rôle. After a few were built in a new factory provided for the purpose, production was discontinued. Thus the development effort had to begin all over again.

The major deficiencies in the M.5 A1, aside from armament, were lack of room in the turret, poor flotation and inadequate cooling. By balancing armour, motive power and armament a new design was begun in April 1943 by the design co-ordinator of the T.7 Light Tank. That vehicle had been distinguished by ease of maintenance. Layouts were worked out in Detroit by Cadillac Motor Car Division of General Motors Corporation, producer of the M.5 A1, but because of a jurisdictional dispute of long standing between two divisions within the Ordnance Department, another design co-ordinator took over and the designation of T.24 was assigned. A "tool room pilot" was completed in October 1943. Tests were so promising that a limited procurement of 1,000 was authorised by Ordnance and approved by Army Ground Forces. At the same time, development of a T.24 E1 model was approved. The T.24 E1 was the same vehicle but represented an attempt to determine the feasibility of using the power unit of the M.18 Gun Motor Carriage or Tank Destroyer. The M.18 used the R975 C-4 engine (which was the same engine



An M.24 light tank in dug-in position in Korea with 75 mm. gun facing rear permitting rear guard defence to make a rapid getaway.
(U.S. Army photo)



An M.41 155 mm. howitzer motor carriage being prepared for combat, north of Hamhung, Korea, on 11th December 1950. (U.S. Army photo)

A multiple gun motor carriage M.19 mounting twin 40 mm. guns and towing an extra ammunition trailer preparing to move forward near Yongsan on 18th August 1950. (U.S. Army photo)

used in later models of the M.4 A1 Medium Tank) and had a stepless torque converter in place of the conventional synchromesh transmission of the M.4 Medium series. This necessitated raising the rear deck and modifying the louvres.

Later, a longer gun with muzzle brake was substituted. However, by the time this modification was completed, it was obvious that the end of the war was in sight and the supply of and performance of the T.24 tanks were considered satisfactory so T.24 E1 was dropped.

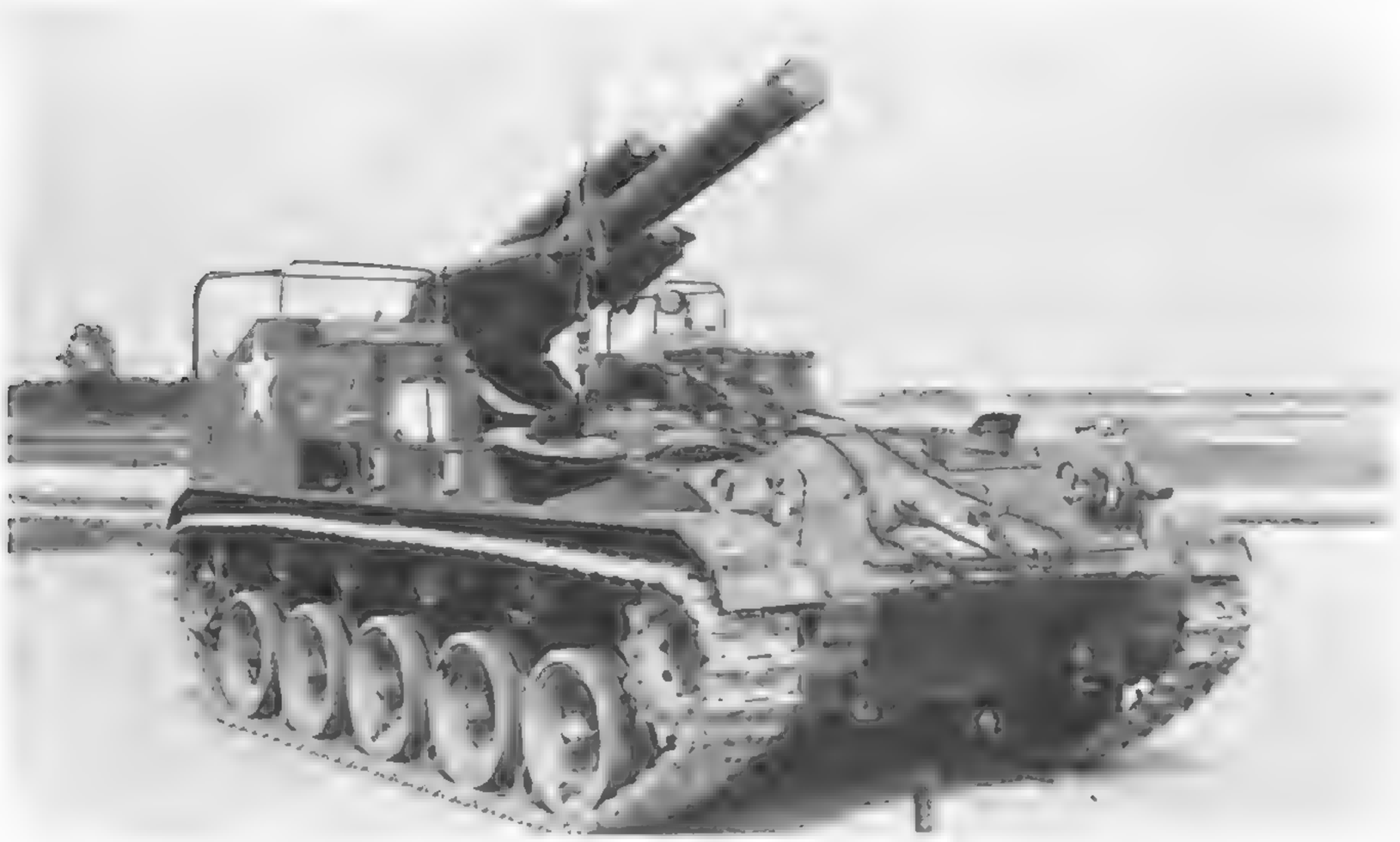
PRODUCTION

Cadillac almost automatically had to be chosen for production because of its experience in producing the M.5 A1 and also because it had been so closely involved in the development work on the T.24. Although M.5 A1 tanks had been produced in both Detroit and Southgate, California, T.24s were produced only in Detroit. These facts made possible the appearance of the first production vehicle in April 1944. In the following month, 24 were produced and the vehicle was standardised as the M.24. Massey-Harris in their Milwaukee plant also had been producing M.5 A1 Light Tanks and were given a contract to produce 1,000 of the new vehicles. A decision was reached to increase the total quantity to 5,000, in order to include related vehicles on the same chassis. Eventually this programme also included American Car and Foundry.

Production of all U.S. combat vehicles was based on troop needs as compiled by Army Service Forces, with contracts let through the various Ordnance Districts, co-ordinated by the Engineering-Manufacturing Division of the Office Chief of Ordnance, Detroit. Each prime contractor used sub-contractors for major assemblies and the latter in turn let further contracts. For each prime contract there could be up to a hundred sub-contractors, who, in turn, could deal with hundreds more. This is the normal American approach to production. Actual production of the several plants was as follows:

T.24 E1 with longer 75 mm. gun and Continental radial engine requiring raised and rounded engine deck.
(Photo: Icks collection)

M.24 stowed for issue to troops. Note pistol port on right side of turret and modified 'A' mount (Photo: Icks collection)



M.41 (T.64 E1) 155 mm. Howitzer motor carriage.
(Photo: Icks collection)

Month	M.24		M.19		M.41
	Cadillac	*Massey-Harris*	*Cadillac*	*Massey-Harris*	*Massey-Harris*
1944					
April	1				
May	24				
June	50				
July	100	10			
August	200	16			
September	212	34			
October	277	40			
November	377	40			
December	499	50			
1945					
January	200	125			
February	300	155			
March	350	192			
April	204	78	1	30	30
May	326	30	24	130	30
June	180		100		
Totals	3300	770	125	160	60
Grand Total	4415				

The contract with American Car and Foundry was for 448 M.37 Howitzer Motor Carriages but it was taken over by Cadillac after October 1945 because war production was running down. Only 316 vehicles were completed. American Car and Foundry did, however, re-work one T.24 into the T.24 E1.

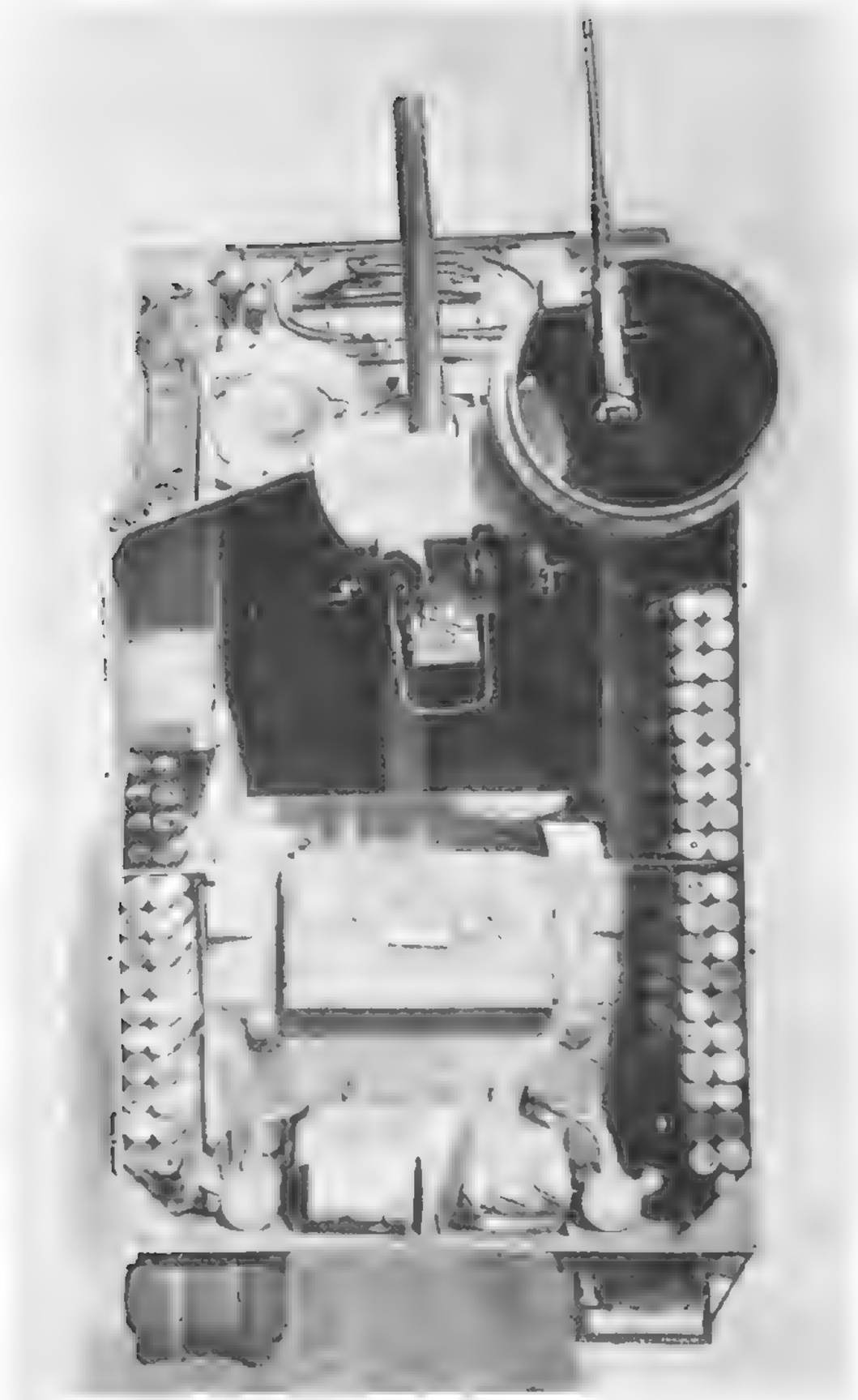
As of September 30, 1945, the unit cost of the M.24 was stated to be $39,653. It should be understood, however, that under the system for procurement which was in use, there were certain items which were not included in this cost. Armament, periscopes and certain items of related nature were furnished to manufacturers as G.F.I. or "government free issue". Actual unit costs therefore are difficult to determine. The costs of the related vehicles varied from the tank cost and the smaller production runs at manufacturers other than Cadillac increased unit costs at those plants.

M.24 DESCRIBED

The general arrangement of the new tank was with the engines and transmissions in the rear, the armament in the centre and the final drive at the bow, with the engine compartment separated from the fighting compartment by a bulkhead. The driver sat at the left front with the assistant driver/radio operator at his right. Dual controls were provided. The commander was on the left side of the turret with the gunner and loader to his right. Originally, only four men were intended as the crew, the assistant driver moving up in combat to become the loader.

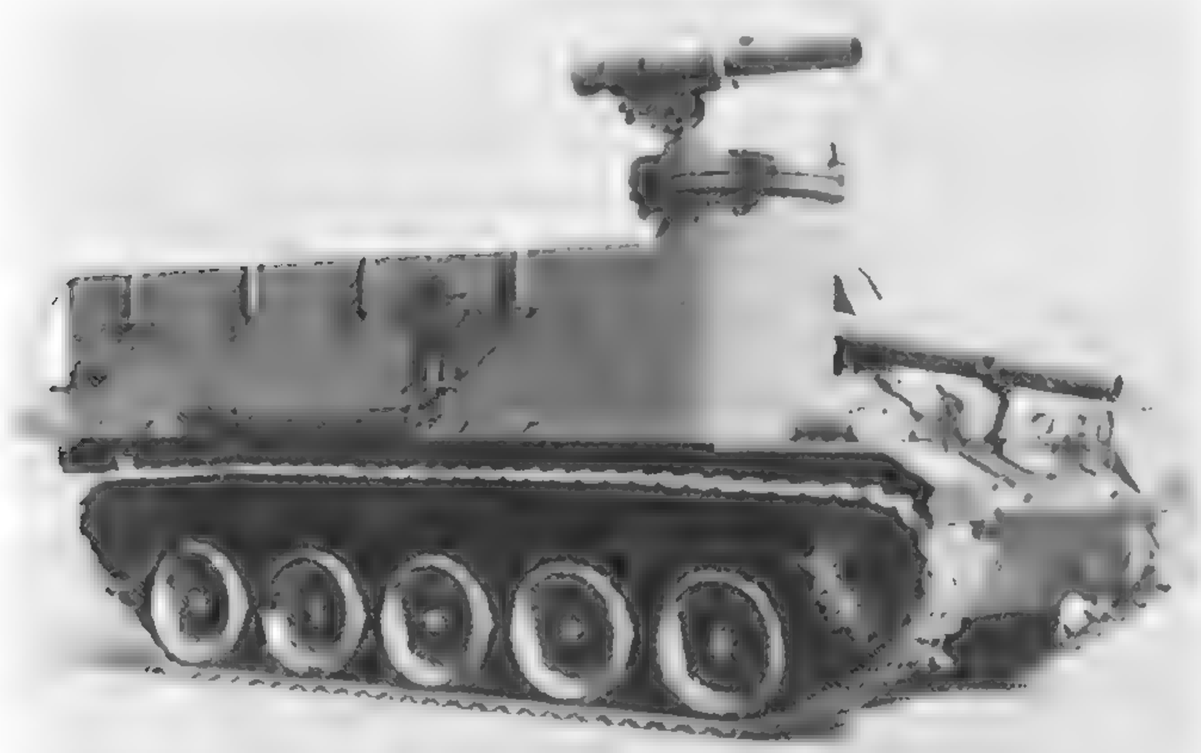
M.19 (T.65 E1) twin 40 mm. Gun motor carriage
(Photo: Icks collection)

The power train of the M.5 A1 had demonstrated its reliability and it was adopted for the new vehicle but with a two speed and reverse manual shift transfer case in place of the automatic unit. The torsion bar suspension from the M.18 Tank Destroyer, being built by another division of General Motors, was adopted. Although commonly thought to have been copied from the Germans, the design co-ordinator and his superior had held American patents on such a suspension from the early 1930's. This suspension provided better riding qualities, better flotation and, in turn, a more stable gun platform. The track adopted was a 16-inch rubber-bushed, centre guide and short pitch steel track called the T.72 which, with later improvements, became the T.72 E1. There were 75 links in each track but when tracks began to stretch through use, one link was removed. The idler was a double steel wheel under tension.



M.37 (T.76) 105 mm. HMC. (Photo: Icks collection)

M.37 (T.76) 105 mm. Howitzer motor carriage with 4·2 in. recoilless mortar substituted for ·50 cal. pulpit machine-gun.
(Photo: Icks collection)



The turret ring was that of the M.5 A1 Light Tank but the turret was larger. Main armament was the light weight 75 mm. T.13 E1 aircraft cannon with a muzzle velocity of 2,050 ft./sec. This later was standardised as the M.6. It was mounted in a T.90 Combination Gun Mount (later standardised as the M.64) which included a ·30 cal. Browning machine-gun on the right. The mount was fixed to the turret by large trunnion brackets on the gun shield. The recoil mechanism was of the concentric hydro-spring type with the mount cradle as the outside cylinder. A machine-gun ammunition box and bag for catching expended cartridge cases were provided. There was no turret basket but the crew seats rotated with the turret. Both guns could be fired either manually or electrically. The 75 mm. firing switch was on the elevating handwheel. The machine-gun electrical firing trigger was located on the power traverse control handle. The mechanical trigger was at the rear of the machine-gun which normally was fired by the loader. The guns were elevated or depressed by the rotation of an elevating handwheel. Traverse was accomplished by the combination manual and hydraulic turret traversing equipment. The commander was provided with a turret traverse override control. The hydraulically operated stabiliser prevented the gun from following the pitching of the vehicle. Both telescope and combination telescope-periscope sights on the left side of the gun were provided for the gunner. The periscope sight was linked to the combination mount and moved with it. The gunner and loader were protected from the recoil of the gun by a recoil guard attached to the cradle. A travel lock on the cradle fastened to a turret roof bracket. A turret lock also was provided for travel. The 75 mm. rounds were carried in water-filled ammunition boxes stored beneath the hull sub-floor.

A ·30 cal. hull machine-gun protruded from a cast blister on the glacis plate. The ball mount was protected by an external hemispherical shield. The cradle supporting the gun was counterbalanced by an equilibrator spring assembly. An expended link chute and expended cartridge case bag were attached to the cradle. Ammunition was supplied through a flexible feed chute from a supply box to the left of the assistant driver who used tracer fire to control his aim through his periscope.

A ·50 cal. machine-gun was mounted on a pintle mount outside the turret for use as an anti-aircraft or anti-personnel weapon by the tank commander who had to be exposed to fire it. The smoke mortar originally mounted to the right of the co-axial machine-gun was removed in post-war vehicles. One radio was located in front of the assistant driver and one or more were located in the rear of the turret. There was a five-position crew interphone.

Armour was welded homogeneous plate with a thickness of one inch which, being ballistically shaped, represented a 2½-inch hull basis and a 1¼-inch turret basis. The 75 mm. gun shield was 1½-inches thick. The armour was thicker than on the M.5 A1, the vehicle had a low silhouette and there was more room in the turret to serve the better armament.

A pivoted hatch was provided for each driver. There was a hinged hatch in the turret top for the loader, a hinged hatch in the commander's vision cupola and a sliding door above a drop escape hatch in the floor behind the assistant driver. The engine air inlet was in the rear deck immediately behind the turret and the air outlet louvres were at the rear of the hull. A two-way ventilator fan in a housing and a dome light extended downward from the top of the hull between the driver and the assistant driver. Various items of additional equipment or stowage

Experimental T.77 E1 Multiple GMC. 1945.
(Photo: Icks collection)

were provided for the crew and vehicle. A shovel, sledge, mattock, axe and handle were mounted on brackets on the outside of the hull as well as a tow cable, tarpaulin, rammer staff, camouflage net and spotlight. Inside there were a flag set, a panel set, flares, a ground signal projector, rations for the crew, a cooking burner, canvas buckets, flashlight and batteries, binoculars, gunner's instruments, spare parts and a set of maintenance tools in a bag on the escape hatch. Fixed fire extinguishers were located on the left side of the fighting compartment operable from either inside or outside for dealing with fires in the engine compartment. A portable fire extinguisher was located between the driver and the assistant driver.

COMMON CHASSIS CONCEPT

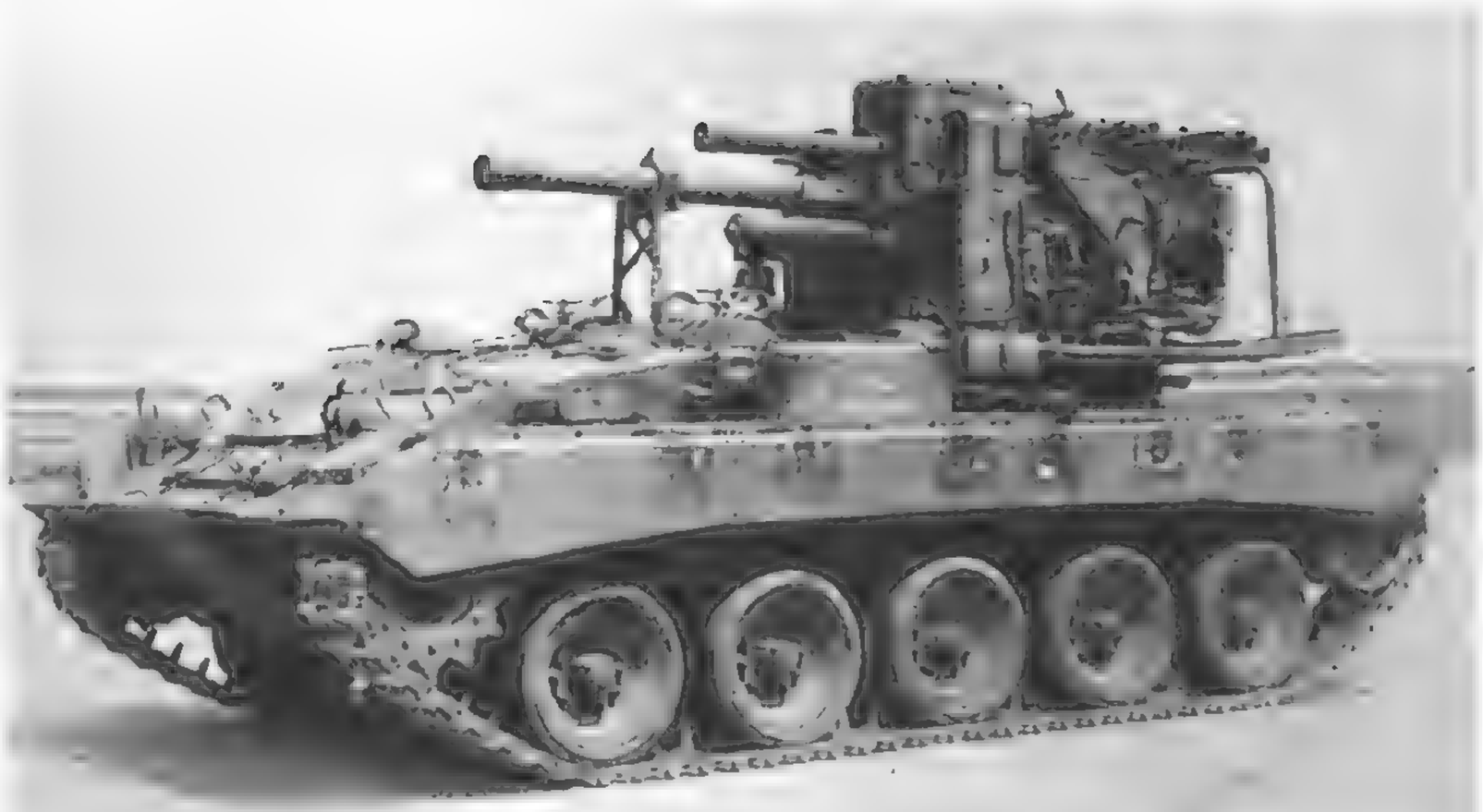
The fundamental design contemplated use of three basic assemblies. The first was the power pack assembly of engines, transmissions, transfer cases, fuel tanks and radiators. The engines were the standard commercial engines used in Cadillac automobiles which had proved themselves in the M.5 A1 Light Tanks. This was the case also with the hydramatic transmission which had been in use on thousands of automobiles and taxicabs before World War II and which had given thousands of miles of satisfactory, trouble-free operation in the M.5 A1 Light Tanks.

The second basic assembly was the power train, comprising the Cletrac controlled differential permitting continuous drive to both front sprockets at all times, together with the final drive and the steering control consisting of brake bands operating in oil. This type of steering had been in use on U.S. tanks ever since its first installation on the Light Tank T.1 E6 in the early 1930's and it had been used on French tanks for several years prior to that.

The third basic assembly was made up of the track, rubber-tyred bogie wheels, the torsion bar system and the support rollers. These three basic assemblies were intended to be used in companion vehicles to form what was also called a Light Combat Team, or Common Chassis Concept.

Experimental T.24 with German 12 ton half-track suspension, 1941.

(Photo: Icks collection)



Experimental 75 mm. T.18 automatic AA gun on modified M.24 chassis, 1947.
(Photo: Icks collection)

White painted for snow camouflage this newly delivered M.24 was photographed during the advance into Germany, February 1945. Tracks and road wheels are still in mint factory condition
(Photo: Imperial War Museum)

M.19 Gun Motor Carriage
The first of the related vehicles to be standardised under the Common Chassis Concept was the M.19 Gun Motor Carriage. Anti-Aircraft Command had requested 1,000 of the T.65 40 mm. Gun Motor Carriage in February 1943. This used the M.5 A1 chassis. Army Ground Forces disapproved because of the knowledge that the M.5 A1 was to be phased out of production. Ordnance immediately began the design of a T.65 E1 vehicle using the T.24 Light Tank as a basis but with the engine compartment amidships, the power train assembly forward and a twin 40 mm. Bofors gun at the rear on a turret platform with a partial shield. This became the M.19 and production of 904 was authorised in August 1944. Later, some of these were produced as M.24 tanks instead.

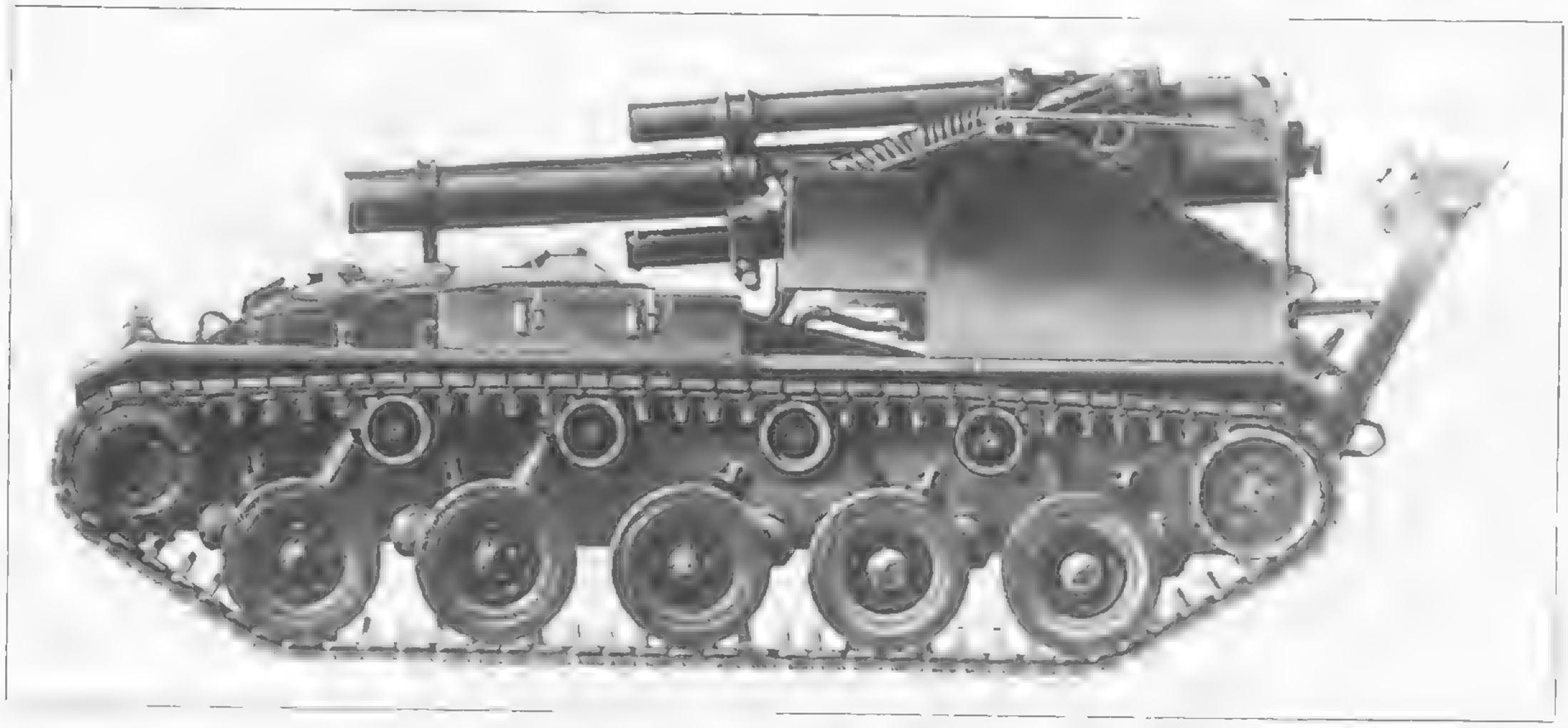
M.41 Howitzer Motor Carriage
The second was the T.64 E1 155 mm. Howitzer Motor Carriage which became the M.41. The arrangement of the components followed that of the M.19.

M.37 Howitzer Motor Carriage
The third was the T.76 105 mm. Howitzer Motor Carriage which was standardised as the M.37. In this version, however, the arrangement was as in the M.24 tank. In appearance, the vehicle somewhat resembled the M.7 Priest.

Experimental Vehicles
In addition to these more or less well known variations, there were other experimental modifications applied to single vehicles. These included the T.38 4·2 inch Mortar Motor Carriage which was a modification of the T.76 Howitzer Motor Carriage, and the T.77 Multiple Gun Motor Carriage. This latter was modified to provide a computing sight and became the T.77 E1. A 90 mm. Gun Motor Carriage T.78 was authorised but the project was never completed. Another project, however, did materialise. This was the Multiple Gun Motor Carriage T.81 mounting a Bofors 40 mm. anti-aircraft gun and two ·50 cal. machine-guns on the chassis of the earlier T.65 E1 Gun Motor Carriage.

Rock Island Arsenal began the mock-up of an intended Mortar Motor Carriage T.96 which would mount the T.36 155 mm. mortar but the project was cancelled at the end of the War.

After World War II, and up to 1951, some additional experimental modifications were made. One was the substitution of the overlapping bogie wheel suspension and track of a German 12 ton half-track for the normal suspension. One vehicle was equipped for testing a wider T.85 E1 rubber block chevron track. This became available as a standard item of issue. When used, vehicle dimensions were changed. Experiments also were conducted with extended grousers to improve flotation under mud conditions. During the Korean War period there was a return to the CDL principle of World War II by adding a powerful light source for night firing by tanks. The use of searchlights mounted on gun tubes became standard for U.S. tanks and the M.24 tanks in service were so fitted. Other modifications included the experimental installation of four 105 mm. recoilless rifles with a partial shield on an M.19 Multiple Gun Motor Carriage; the installation of a T.45 ten tube



155 mm. Howitzer Motor Carriage M.41, unofficially called "Gorilla". The howitzer, shown here in its travelling lock, was mounted on the chassis of the M.24 Light Tank. When the manual winch-operated recoil spade at the rear was lowered, the firing platform rested on it. The Gorilla was used in U.S armored divisions until replaced by the 155 mm. HMC M.44 in the mid-1950s.

rocket projector on either side of the turret on a standard M.24; a T.122 remote control cupola machine-gun unit mounted on the turret of an M.24 tank. This last led to a long series of remote control cupolas eventually culminating in the cupola presently mounted on current U.S. tanks and other armoured vehicles; there also was an installation of a 75 mm. T.18 automatic anti-aircraft gun on the stripped chassis of an M.24 tank. There were experimental additions of a 75 mm. recoilless rifle in place of the pulpit machine-gun in an M.37 Howitzer Motor Carriage as well as a similar installation of a 4·2-inch T.38 mortar in the same position. None of these vehicles was given either a "T" or an "M" designation. Finally, one chassis was modified to become the Armoured Utility Vehicle T.3 which was the forerunner of the M.44 Armoured Personnel Carrier which vehicle, however, utilised the chassis of the M.18 Gun Motor Carriage rather than that of the M.24 Light Tank.

There probably have been several modifications made in some of the other countries possessing M.24 Light Tanks but the only one concerning which there is specific knowledge is the exchange made in France between the M.24 and the French AMX.13. There, an AMX.13 oscillating turret was mounted on an M.24 and the M.24 turret was mounted on the AMX.13 for experimental reasons.

TACTICAL EMPLOYMENT

Light tanks in the U.S. Army were considered reconnaissance vehicles, being used in the same manner as armoured cars are used in other armies. American theory and practice long had held that a tracklaying vehicle could negotiate any terrain where an armoured car could operate and go many places where an armoured car could not. Tactics therefore often became whatever the individual tank commander on a reconnaissance mission might decide under a given set of circumstances. Conditions in Korea were exceptional.

The need for fire power of all kinds in defending against the advance of North Korean forces in 1950 caused the M.24 to be used as mobile artillery, as an anti-tank weapon, both mobile and dug-in, for flank protection and in other unorthodox ways forced by conditions. It was outgunned but it was mobile and reliable and the courage of individual crews often produced performance which normally would not have been expected of a light tank.

The M.24 played and continues to play a part in the combat vehicle history of many countries. From the standpoint of design, it was a fine example of the blending of existing components into an entirely new concept which led not only to refinements in succeeding light tanks but to refinements and improvements in later main battle tanks as well. And, although well over 25 years old, it is still a good light tank.

A.F.V. Series Editor: DUNCAN CROW

SPECIFICATION—M.24 CHAFFEE

General
Crew: Five—commander, gunner, loader, driver, radio operator (assistant driver).
Battle weight: 40,500 lb.
Dry weight: 36,250 lb.
Power/weight ratio: 10·86 b.h.p./short ton.
Ground pressure: 11 lb./sq. in.

Dimensions
Length overall, gun to front: 18 ft. 0 in.
Hull length, overall: 16 ft. 4½ in.
Height, to top of cupola: 8 ft. 1½ in.
Width overall: 9 ft. 8 in.
Track centres/wheelbase: 10 ft.
Track width: 16 in.

Armament
One semi-automatic 75 mm. M6 gun, turret mounted.
One ·30 cal. Browning M1919A4 machine-gun, mounted coaxially.
One ·30 Browning M1919A4 machine-gun mounted, on right glacis.
One ·50 cal. Browning M2 machine-gun, heavy barrel, pintle mounted on top of turret.
One fixed 2 inch smoke mortar M3 (eliminated in 1946).

Fire Control
Stabilisation in elevation, hand elevation, power traverse (hydraulic).

Ammunition
48 rounds 75 mm. APC. HE and WP (Smoke); 420 rounds ·50 cal.; 4,125 rounds ·30 cal

M.24 with T.122 remote control machine gun mount. Weights are placed on the fenders for proving trials. (Photo: Icks collection)

Sighting and Vision
Commander's vision cupola.
Gunner's periscope M10P or M4A1 with telescope, M77G or M38A2; telescope M83F or M71K.
Loader's, driver's and assistant driver's periscope M13, M13B1, M6, M15 or M15A1.

Communications
Radios: SCR-508, SCR-528,SCR-608, SCR-628 or RC-99 and RC-298 and AN/VRC-3, SCR-508, SCR-528 or AN/GRC-3-4-5-6-7 or 8.

Armour
Homogeneous welded.
Hull: upper front 1 in./60°, lower front 1 in./45°, upper sides-front 1 in./12°, lower sides-rear ¾ in./12°, rear ¾ in./0°, top ½ in., floor ⅜ in.
Turret: front mantlet: 1½ in. at various angles, sides 1 in./25°, top ½ in.

Engine
Two Cadillac Model 44T24. Petrol.
4 cycle, L-head, 90° V-8. Water-cooled. 349 cu. in. 110 b.h.p. at 3,400 r.p.m.
Fuel: 110 gal. (U.S.) in sponsons.

Transmission
Two General Motors Hydramatic 4F with 2 F/1R transfer case.
Cletrac differential, mechanical steering lever brakes with depressor knobs for parking lock.

Suspension
Torsion bar: Five dual rubber-tyred bogie wheels per side 25½ in. × 4½ in. with 22½ in. ×5 in. dual steel disc idler. 75 steel track shoes per side 16 in. wide 5½ in. pitch (74 after track was stretched).

Electrical System
Delco-Remy Model 1117309 Generator 24 volt, 50 amp.

Performance
Max road speed cross country: 30 m.p.h.
Max. gradient: 31°.
Vertical obstacle: 3 ft. Trench: 8 ft.
Wading depth: 3 ft. 4 in. unprepared, 6.ft 6 in. prepared.
Average fuel consumption: 7–8 m.p.g. (U.S.).
Radius: 100 miles.

Special Features
Can be fitted with dozer blade and flotation or wading equipment.

COMMON CHASSIS VARIANTS

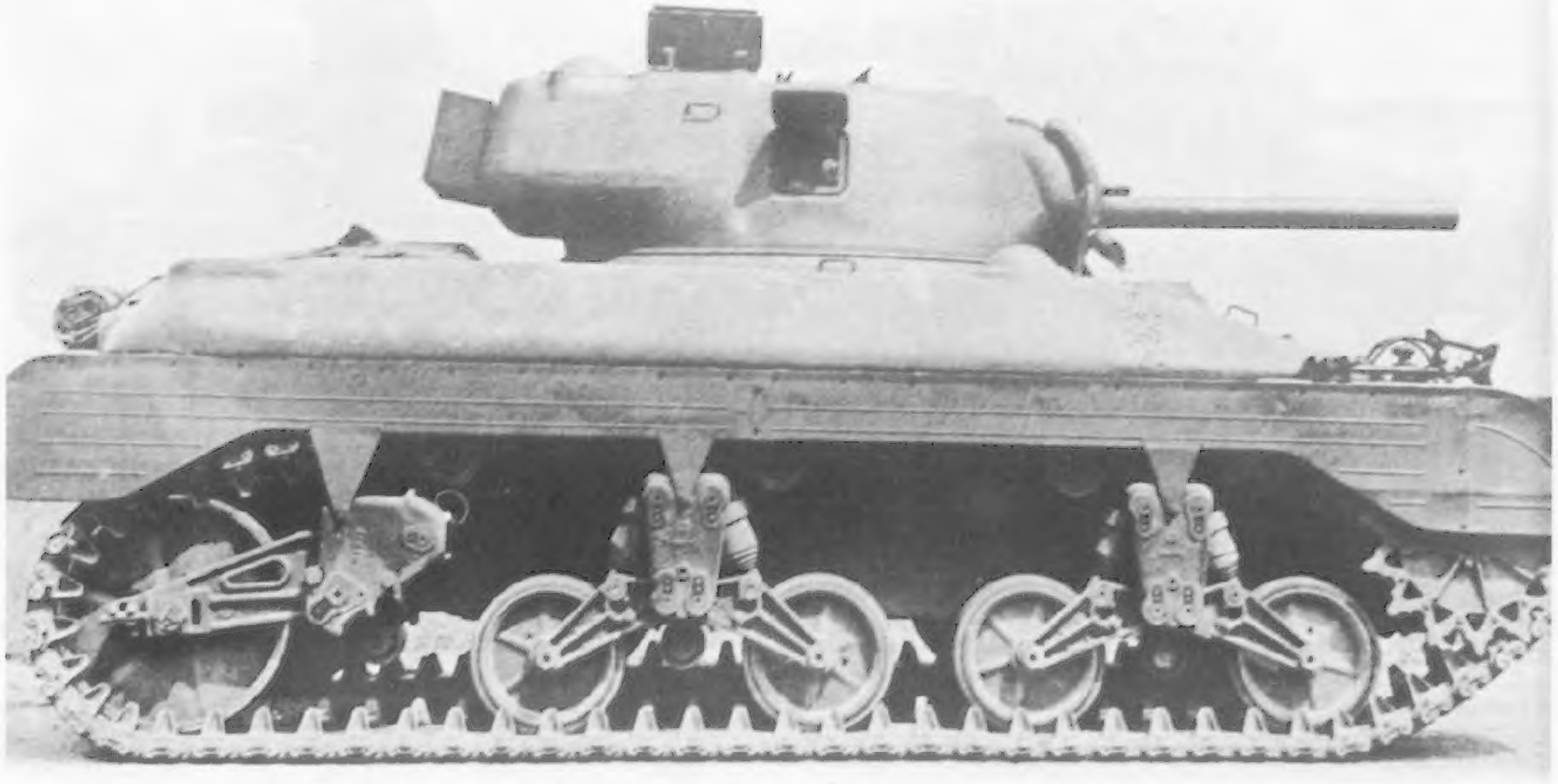
Following are the essential data for the vehicles of the series other than the M.24 proper. In spite of several questionable differences, these are official data in all cases and apply to vehicles equipped with the T.72 E1 tracks. When equipped with T.85 E1 tracks, all outer dimensions and obstacle capabilities varied with these as well as the M.24.

Feature	*T.24*	*M.19 A1*	*M.37*	*M.41*
Crew	5	6	7	12
Length O/A	216 in.	218 in.	216 in.	230 in.
Length vehicle	195 in.	218 in.	216 in.	232 in.
Width	112 in.	115 in.	118 in.	111 in.
Height	97 in.	117 in.	95 in.	96 in.
Clearance	17 in.	18 in.	18⅜ in.	17¾ in.
Track width	16 in.	16 in.	16 in.	16 in.
No. of links	75	75	75	75
Main armament	75 mm. gun	40 mm. gun	105 mm. how.	155 mm. how.
No. of rounds	48	350	26	22
Weight loaded	38,750 lb.	41,165 lb.	46,000 lb.	43,000 lb.
*Ground pressure	10·7 lb.	9·7 lb.	11·7 lb.	10·8 lb.
Electrical system	24 volt	24 volt	24 volt	24 volt
Fuel capacity	110 U.S. gal.	110 U.S. gal.	110 U.S gal.	110 U.S. gal.
Engine	2/110 h.p.	2/110 h.p.	2/110 h.p.	2/110 h.p.
Grade	31°	31°	31°	31°
Ford	42 in.	42 in.	42 in.	42 in.
Trench	88 in.	88 in.	108 in.	108 in.
Vertical obstacle	32 in.	32 in.	36 in.	40 in.
Speed	30–35 m.p.h.	30–35 m.p.h.	30–35 m.p.h.	30–35 m.p.h.
Radius	100 miles	100 miles	100 miles	96 miles
Turning radius	23 ft.	23 ft.	23 ft.	23 ft.

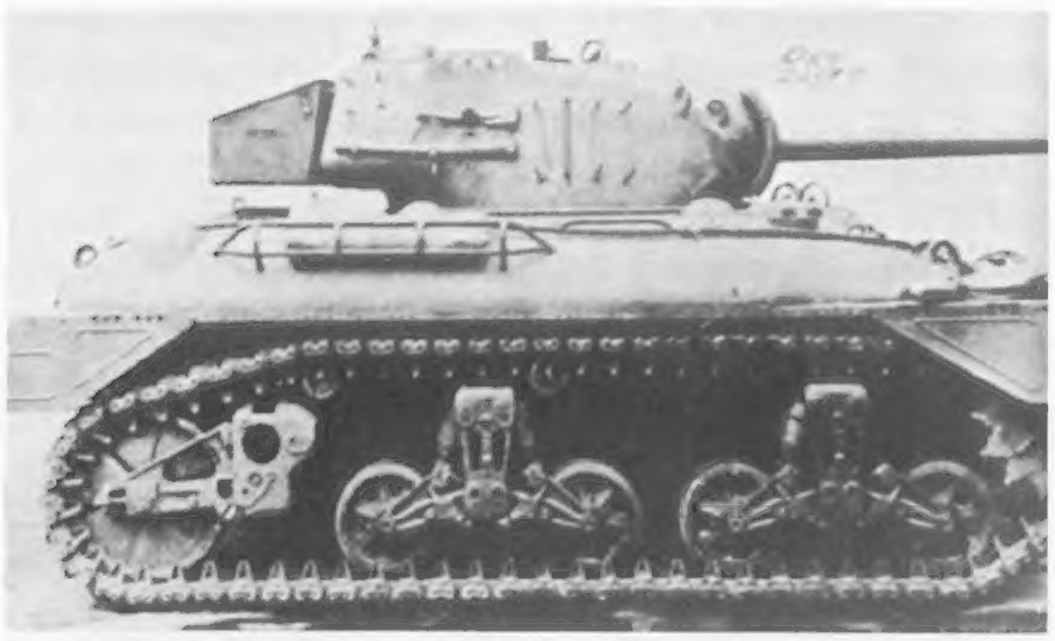
**Per square inch*

Heavily sandbagged for extra protection, an advanced reconnaissance unit M.24 disembarks on the east bank of the Rhine.
(Photo: Imperial War Museum)

French M.24 with AMX.13 oscillating turret. One track return roller removed. (Photo: Icks collection)



The T.7 E2 Light Tank with 57 mm. (6 pdr) gun. The T.7 was an excellent light tank, but it ended up standardised as an inferior medium tank, the M.7. Originally , early in 1941, two prototypes were scheduled to be built: the T.7 with welded hull, cast turret, and vertical volute suspension; and the T.7 E1 with riveted hull, cast/welded homogeneous turret, and horizontal volute suspension. The T.7 E1 was never completed, but three further prototypes were built: T.7 E2 with cast hull top, cast turret, and Wright R-975 engine; T.7 E3 with welded hull and turret, automatic transmission, and twin Hercules diesel engines, and T.7 E4 with welded hull and turret, hydramatic transmission, and Cadillac twin engines. The T.7 E2 was selected as the most suitable and the design was approved in December 1941. During construction it was decided to fit a more powerful gun than the 37 mm. originally specified. The 57 mm. T.2 (6 pdr) gun was selected. This was an adaptation of the British 6 pdr and was being fitted to the Canadian Ram II tanks. The T.7 E2 was therefore given a Ram turret ring and was completed with the 57 mm. gun in June 1942. The Armored Force now asked that the tank be modified to take a 75 mm. M.3 gun. The turret was re-designed and the 75 mm. gun mounted. By this time increase of armour thickness and other modifications had brought the tank's weight up from the 14 short tons originally specified to 25 short tons. This took it out of the light tank class and it was standardised in August 1942 as the M.7 Medium Tank.



M.7 Medium Tank with 75 mm. gun. A production contract for 3,000 of these tanks was awarded to International Harvester Co. in December 1942, but production was cancelled in February 1943 after only seven had been built. The reason for cancellation was that the M.7 proved unsatisfactory—its weight (29 short tons when fully stowed and with crew aboard) making it badly underpowered. By this time the M.4 Medium (Sherman) was in full production and it was decided to concentrate production on the more efficient vehicle.

T.16 Light Tank. As well as the T.7 there were several other light tank projects in the United States during World War II. Of these only the T.16 reached the production stage. The T.16 was built by Marmon-Herrington as a Lease-Lend light weight (8·4 tons) two-man tank for China and the Netherlands East Indies. It had a ·30 cal Browning machine-gun in its turret and a second ·30 cal gun for anti-aircraft use. The T.16 had its turret on the right hand side. With the turret on the left hand side the tank was designated T.14. The Marmon-Herrington identifications were: T.14 = CTLS – 4TAC: T.16 = CTLS – 4TAY. 240 vehicles were produced, of which some were used in the U.S. Army. The other light tank projects, all of which were aborted, were: T.13, designed by Allis-Chalmers, similar in size and layout to the T.16, armed with a single 20 mm. Hispano-Suiza cannon; T.10 (Amphibian), 37 mm. gun, 18 mm. armour maximum, 12½ short tons; and T.21 which was to be a light tank version of the T.20 Medium Tank, with a 76 mm. gun, 30 mm. armour maximum, and weighing 24 short tons.

AFV/Weapons Profiles

Edited by DUNCAN CROW

FORTHCOMING TITLES:

45 Vickers 37-ton Main Battle Tank
The publishers regret that the publication of AFV/Weapons 45 has been delayed owing to circumstances beyond their control. Notice of a publication date will be given as soon as possible.

47 T-34
The development of the Russian T–34 tank and the discomfiture and surprise of the German Army in finding its panzers outclassed by the T–34/76 ("the best tank in any army up to 1943" in Guderian's judgment) are described BY J. M. BRERETON. In the second half of this *Profile* a description of the even more powerful T–34/85 with its increased firepower, and a critique of the T–34 in service, are given BY MAJOR MICHAEL NORMAN, Royal Tank Regiment. (T34/76 is a revised Armour in Profile, T–34/85 is new).

48 PanzerKampfwagen VI - Tiger I and II
"Slow and heavy, large and cumbersome" the Tiger may have been, but it was a formidable tank to encounter and could stand tremendous punishment on its thick frontal armour. This Profile tells the story of the legendary Tiger – both the Tiger I (SdKfz 181) and the Tiger II or King Tiger (SdKfz 182). They had their drawbacks from the logistic and tactical points of view – faults that were rarely apparent to those who had to face them. Also included is the "tank hunter" version of the King Tiger – the Jagdtiger – and an account of the super-heavy tank projects, the Maus and the E100. (Tiger I is a revised Armour in Profile, the rest is new).

49 Japanese Medium Tanks
Japanese tank development started from 1925. One of the officers of the Imperial Japanese Army concerned with this development from the very outset was Captain (now LIEUTENANT-GENERAL) TOMIO HARA. From his own unrivalled personal experience General Hara in this Profile describes the designing, building, and performance of Japanese medium tanks from Prototype No. 1 (1925-27) through Type 89 (1929), Type 97 (CHIHA) (1937), Type 1 (CHIHE) (1940), Type 3 (CHINU) (1943), Type 4 (CHITO) (1943), to Type 5 (CHIRI) (1944). Also included is a detailed explanation of the year/model designation given to Japanese tanks and the abbreviations used in nomenclatures.

FUTURE TITLES WILL INCLUDE

Swiss Pz 61 and 68 Medium Tanks
Prototypes of the Pz 61, the Swiss Army's Main Battle Tank, were built in 1958 and 1959 and pre-production vehicles with a 90mm gun appeared in 1961: they were designated Pz 58. The Pz 58 was then equipped with a 105mm gun and went into production as the Pz 61. The Pz 68 is a further development. BY R. M. OGORKIEWICZ.

The Abbot
The Abbot (FV 433 105mm Field Artillery Self-Propelled) is the first British gun designed specifically for the self-propelled role. It was produced to replace the 25pdr field gun and went into troop service in 1965 when the first regiment to be equipped with it was the 3rd Royal Horse Artillery. This Profile by CHRISTOPHER F. FOSS also includes the Value Engineered Abbot and the Falcon Anti-Aircraft System.

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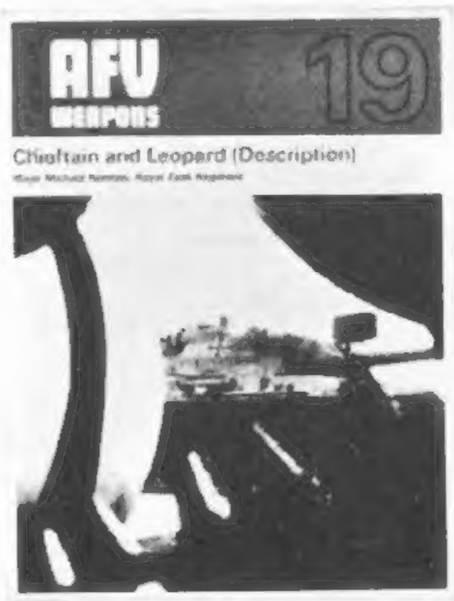

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